

When there are two or three synangia they may still be separate, but they are crowded together, and in some cases may be more or less fused. Some cases at least of irregular quinquelocular synangia are due to the fusion of two original synangia, owing doubtless to the close proximity of their primordia. But if originally distinct synangia may become fused in their development, we have less difficulty in understanding how the three loculi of the synangium may be due to the fusion of three primitively separate sporangia.

The most important inference from this comparison is that the repeated dichotomy of the sporophylls of the family Psilotæ is an ancient feature. A real affinity with the Sphenophyllales is thereby rendered more probable.

In determining the affinities of the Phanerogams it is the custom to attach more importance to the characters of the flowers than to the vegetative characters, which are subject to many adaptive modifications. Bower has recently urged\* the importance of the characters of the reproductive organs, and especially of the sporangia, in determining the affinities of the genera of Ferns. If we allow that the characters of the sporophylls and sporangia are entitled to more weight than vegetative characters in deciding the affinities of the Psilotæ, the family must be placed in the Sphenophyllales rather than in the Lycopodiiales. The whorled arrangement of the leaves of the typical family Sphenophylleæ is the chief objection to this, but phyllotaxis is often a very variable character, and notably so in the Psilotæ, even though it must be admitted that the arrangement in whorls appears to have been a very constant feature in the Sphenophylleæ. It would seem, therefore, that although the character of the sporophylls, and especially the sporangiophores, justifies our including the Psilotæ in the class Sphenophyllales, they yet form a family rather remote from the Sphenophylleæ.

"On the Excretory Organs of *Amphioxus*." By EDWIN S. GOODRICH, M.A., Fellow of Merton College, Oxford. Communicated by E. RAY LANKESTER, F.R.S. Received January 7,—Read January 23, 1902.

Some years ago, in 1890, Weiss and Boveri discovered excretory tubules in the pharyngeal region of *Amphioxus*.† Soon after Boveri

\* 'Phil. Trans.,' B, vol. 192, 1900, p. 30.

† Weiss, F. E., "Excretory Tubules in *Amphioxus lanceolatus*," 'Quart. Jour. Micr. Sci.,' vol. 31, 1890; Boveri, Th., "Ueber die Niere des *Amphioxus*," 'Sitz.-Ber. d. Ges. f. Morph. u. Phys. in München,' Jahrg. 6, 1890.

published a detailed description and figures of these segmental kidneys.\*

According to Boveri, each organ consists of a narrow ciliated tubule opening on the one hand into the atrium at the top of a secondary gill-bar, and on the other hand into the dorsal coelom by one or more funnels. Groups of peculiar cells, called "fadenzellen," are spread round each funnel, attached to the coelomic wall. These cells send each a long fine process passing towards the lip of the funnel across its opening.

During a visit to Naples this winter, I determined to re-examine these structures in *Amphioxus*, with a view to comparing them with the nephridia of certain Polychaete worms; and I am now able to state that the so-called "fadenzellen" are in reality typical *solenocytes*, such as I have described in the Glyceridae, Phyllodocidae, Alciopidae, and Nephthyidiae.†

Hitherto the excretory cells, named solenocytes, have been known to occur only at the inner extremity of nephridia, which end blindly, having no direct communication with the coelom. Each solenocyte consists of a cell-body and nucleus situated at the distal free extremity of a delicate tube. The proximal end of the tube pierces the wall of the nephridial canal, and opens into its lumen. A single long flagellum, arising from the cell, works in the tube and projects into the canal.

Now I find that the excretory organ of an adult *Amphioxus* is formed of a ciliated tubule having an external but no internal opening. It is more or less branched, and the branches bear innumerable solenocytes with narrow thread-like tubes of remarkable length. At the distal end of each tube is situated the cell-body and nucleus, and inside it vibrates a flagellum which passes into the lumen of the excretory canal.

It may be concluded from these observations that, in their function segmental arrangement, and detailed histological structure, the excretory organs of *Amphioxus* are essentially identical with the nephridia of certain Polychaete worms.

\* Boveri, Th., "Die Nierencanälchen des *Amphioxus*," 'Zool. Jahrb.,' vol. 5, 1892.

† Goodrich, E. S., "On the Nephridia of the Polychaeta," 'Quart. Jour. Micr. Sci.,' Part 1, vol. 40, 1897; Part 2, vol. 41, 1898; Part 3, vol. 43, 1900.

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